

# Claims

- [c1] A method for measuring and setting grid voltages in an image forming device comprising:
- setting a first charging device of a first image forming station to a first voltage level and setting a second charging device of the first image forming station to be off;
  - charging a charge-retentive surface with the first charging device set at the first voltage level;
  - measuring and the charge imparted to the charge-retentive surface by the first charging device;
  - storing the measured charge value;
  - repeating the setting, charging, measuring and storing steps for the first charging device for at least one additional voltage level; and
  - determining at least one parameter of the first charging device based on the stored measured charge values for the first charging device for each voltage level.
- [c2] The method according to claim 1, further comprising:
- repeating the setting, charging, measuring, storing and determining steps for at least one additional first

charging device at a second image forming station.

[c3] The method according to claim 2, further comprising:  
before advancing the charge-retentive surface to another image forming station, discharging a portion of the charge-retentive surface, which was charged during the charging step for the charging device of the previous image forming station, that will be measured at the next image forming station; and  
advancing the charge-retentive surface to the next image forming station.

[c4] The method according to claim 3, further comprising:  
determining an operating grid voltage for each first charging device based on the at least one parameter; and  
determining a combined target voltage level to be imparted on the charge-retentive surface by each image forming station during image formation.

[c5] The method according to claim 1, wherein determining at least one parameter comprises determining at least one of an operating slope and an offset value for each first charging device of each image forming station.

[c6] The method according to claim 5, wherein determining

at least one of the operating slope and the offset value for each first charging device comprises determining at least one of the operating slope and the offset value for each first charging device by performing linear data fitting on the measured charge values.

- [c7] The method according to claim 3, further comprising:
  - setting each first charging device to its operating grid voltage level during image formation;
  - setting each second charging device to be off;
  - measuring the charge level imparted on the charge-retentive surface at each image forming station; and
  - adjusting a voltage level of the second charging device at each image forming station when the measured charge level on the charge-retentive surface differs from the target voltage level for that image forming station by more than a predetermined amount.
- [c8] The method according to claim 1, wherein setting the first charging device to the first voltage comprises setting a DC charging device to the first voltage.
- [c9] The method according to claim 8, wherein setting the second charging device to be off comprise setting an AC charging device to be off.

- [c10] The method according to claim 8, wherein setting the second charging device to be off comprises setting a DC charging device to be off.
- [c11] The method according to claim 1, wherein setting the first charging device to the first voltage comprises setting an AC charging device to the first voltage.
- [c12] The method according to claim 11, wherein setting the second charging device to be off comprises setting an AC charging device to be off.
- [c13] The method according to claim 11, setting the second charging device to be off comprises setting a DC charging device to be off.
- [c14] A method for measuring and setting DC grid voltages in an image forming device, comprising:  
    setting a first DC charging device at a first image forming station to a first voltage level and setting an AC charging device at the first image forming station to be off;  
    charging a charge-retentive surface with the first charging device set at the first voltage level;  
    measuring the charge imparted to the charge-retentive surface by the first charging device;  
    storing the measured charge value;

repeating the setting, charging, measuring and storing steps for the first DC charging device for at least one additional voltage level; and  
determining at least one parameter of the first DC charging device based on the stored measured charge values for the first charging device.

[c15] The method according to claim 14, wherein determining at least one parameter comprises determining at least one of a DC operating slope and a DC offset value for each DC charging device of each image forming station.

[c16] The method according to claim 15, wherein determining at least one of the DC operating slope and the DC offset value for each DC charging device comprises determining at least one of the DC operating slope and the DC offset value for each DC charging device by performing linear data fitting on the measured charge values.

[c17] The method according to claim 16, further comprising: repeating the setting, charging, measuring, storing and determining steps for at least one additional DC charging device at a next image forming station.

[c18] The method according to claim 15, further comprising: discharging a portion of the charge-retentive surface, which was charged during the charging step for

the charging device of the previous image forming station, that will be measured at the next image forming station; and  
advancing the charge-retentive surface to the next image forming station.

[c19] The method of claim 16, further comprising:  
determining a DC operating grid voltage for each DC charging device based the at least one parameter;  
and  
determining a combined target voltage level to be imparted on the charge-retentive surface by each image forming station during image formation.

[c20] The method of claim 19, further comprising:  
setting each DC charging device to its DC operating grid voltage level during image formation;  
measuring the charge level imparted on the charge-retentive surface at each image forming station; and  
adjusting a voltage level of the AC charging device at an image forming station when the measured charge level on the charge-retentive surface differs from the target voltage level for that image forming station by more than a predetermined amount.

[c21] A method for determining operating voltages in a split

recharge image forming system having a plurality of image forming stations, each station having a DC charging device and an AC charging device, the method comprising:

- determining a combined target voltage level to be imparted on a charge-retentive surface during image formation by each DC charging device and AC charging device in combination, based on at least a determined DC grid operating voltage, and at least one determined DC parameter;

- measuring, for each image forming station, the charge imparted on the charge-retentive surface during image formation by the DC charging device and the AC charging device of that image forming station;

- determining, for each image forming station, if the measured charge differs from the target voltage level by more than a determined amount;

- adjusting, for each image forming station that has a measured charge that differs from the target voltage level by more than the determined amount, the charge level of the AC charging device for that image forming station.

[c22] A charge parameter determining system usable to measure and set operating voltages in a split recharge image

forming apparatus that has a plurality of image forming stations, each image forming station having a first charging device and a second charging device, a voltage sensing device and an exposure device, the system comprising:

- a charge device parameter determining circuit, routine or application that determines at least one charge device parameter of each first charging device;
- a grid voltage determining circuit, routine or application that determines at least one grid voltage for each first charging device and a combined target voltage level;
- and
- a voltage adjusting circuit, routine or application which adjusts the grid voltage level of the second charging device to maintain the target voltage level at each image forming station.

[c23] The charge parameter determining system of claim 22, wherein the charge device parameter determining circuit, routine or application determines one of a slope and an offset for each first charging device based on charge levels measured by each voltage sensing device corresponding to a plurality of charge levels.



[c24] The charge parameter determining system of claim 22, wherein the grid voltage determining circuit, routine or application determines a grid voltage level for operating the each first charging device during image formation and a combined target voltage level based on at least one of the slope and the offset of each first charging device and at least one process control input.

[c25] The charge parameter determining system of claim 24, wherein the grid voltage adjusting circuit, routine or application adjusts the grid voltage level of each second charging device during runtime to achieve the target voltage levels on the charge-retentive surface during image formation in response to variations between measured voltage levels and the target voltage levels which exceed a determined value.

[c26] A computer-readable storage medium containing instructions for measuring and setting grid voltages in an image forming device, comprising:

- instructions for setting a first charging device of a first image forming station to a first voltage level and setting a second charging device of a second charging device of the first image forming station to be off;
- instructions for charging a charge-retentive surface

with the first charging device set at the first voltage level;  
instructions for measuring and the charge imparted to the charge-retentive surface by the first charging device;  
instructions for storing the measured charge value;  
instructions for repeating the setting, charging, measuring and storing steps for the first charging device for at least one additional voltage level; and  
instructions for determining at least one parameter of the first charging device based on the stored measured charge values for the first charging device for each voltage level.

[c27] The computer-readable storage medium of claim 26, further comprising instructions for repeating the setting, charging, measuring, storing and determining steps for at least one additional first charging device at a next image forming station.

[c28] The computer-readable storage medium of claim 27, further comprising:  
instructions for discharging a portion of the charge-retentive surface,  
which was charged during the charging step for the charging device of the previous image forming station, that will be measured at the next image forming

station, before advancing the charge-retentive surface to another image forming station; and instructions for advancing the charge-retentive surface to the next image forming station.

- [c29] The computer-readable storage medium of claim 27, further comprising:
- instructions for determining an operating grid voltage for each first charging device of each charging device pair based on the at least one parameter; and
  - instructions for determining a combined target voltage level to be imparted on the charge-retentive surface by each image forming station during image formation.
- [c30] The computer-readable storage medium of claim 26, wherein the instructions for determining at least one parameter comprises instructions for determining at least one of an operating slope and an offset value for each first charging device of each image forming station.
- [c31] The computer-readable storage medium of claim 30, wherein the instructions for determining at least one of the operating slope and the offset value for each first charging device comprises instructions for determining at least one of the operating slope and the offset value

for each first charging device by performing linear data fitting on the measured charge values.

[c32] The computer-readable storage medium of claim 27, further comprising:

instructions for setting each first charging device of each charging

device pair to its operating grid voltage level during image formation;

instructions for measuring the charge level imparted on the charge-retentive surface at each image forming station; and

instructions for adjusting a voltage level of a second charging device of each charging device pair at an image forming station when the measured charge level on the charge-retentive surface differs from the target voltage level for that image forming station by more than a predetermined amount.

[c33] The computer-readable storage medium of claim 26, wherein the instructions for setting a first charging device of a first image forming station to the first voltage level comprising instructions for setting a DC charging device to the first voltage level.

[c34] The computer-readable storage medium of claim 33, the instructions for setting a second charging device of the

first image forming station to be off comprising instructions for setting an AC charging device to be off.

[c35] The computer-readable storage medium of claim 33, the instructions for setting a second charging device of the first image forming station to be off comprising instructions for setting an DC charging device to be off.

[c36] The computer-readable storage medium of claim 26, wherein the instructions for setting a first charging device of a first image forming station to the first voltage level comprising instructions for setting an AC charging device to the first voltage level.

[c37] The computer-readable storage medium of claim 36, the instructions for setting a second charging device of the first image forming station to be off comprising instructions for setting an AC charging device to be off.

[c38] The computer-readable storage medium of claim 36, the instructions for setting a second charging device of the first image forming station to be off comprising instructions for setting an DC charging device to be off.